



## Original Research Article

### Effect of Amla, an approach towards the control of Diabetes mellitus

K.V.Santhi Sri<sup>1</sup>, D.Jalaja Kumari<sup>2</sup>, G.Sivannarayana<sup>3</sup>

<sup>1</sup>Department of Food and Nutritional Sciences, Acharya Nagarjuna University, A.P, India

<sup>2</sup>Department of Food and Nutritional Sciences, Acharya Nagarjuna University, A.P, India

<sup>3</sup>Department of Extension, Agricultural College, Bapatla, A.P, India

\*Corresponding author e-mail: [santhi2020@rediffmail.com](mailto:santhi2020@rediffmail.com)

#### A B S T R A C T

*Emblica officinalis* (Amla) are widely used in the Indian system of medicine and believed to increase defense against disease. Vitamin C, tannins and flavonoids present in amla have very powerful antioxidant activities. Due to rich Vitamin C, amla is successful used in the treatment of Diabetes mellitus. To study the effect of Amla in type 2 diabetes mellitus (T2DM) we selected 60 T2DM subjects from Acharya Nagarjuna University in Guntur at Andhra Pradesh and they were divided into two groups, control group (N=30) and experimental group (N=30). The data were collected on general information, background information, clinical information, anthropometry and 24 hour dietary recall along with fasting blood sugar, lipid profile and glycosylated hemoglobin. The experimental group of 30 patients was given a medium sized fresh Amla (approximately 35 g) on a daily basis for 6 months. The Amla was procured from the local vegetable market of Guntur city. They were asked to consume the fruit in a raw form daily before breakfast. During the course of supplementation no modification in the diet or medication was made for both experimental and control groups. The anthropometric measurements and Biochemical parameters like FBS, PPBS, HBA1C and lipid profile were monitored at the end of supplementation period. Supplementation of one medium size Amla (35g) for 6 months led to a significant decrease in the FBS,PPBS,HBA1C,Lipid profile values in the experimental group. There were no significant changes in the control group.

#### Keywords

Diabetes mellitus;  
*Emblica Officinalis*;  
Bio chemical parameters;  
Vitamin C;  
Amla.

## Introduction

Diabetes is a chronic disorder of carbohydrate, fat and protein metabolism characterized by increased fasting and post prandial blood sugar levels Gupta *et al.*, (2005). Type 2 Diabetes is one of the

major health problems throughout the world especially in adults in age above 35 years in both sexes (Marshall and Banert 2004). The involvement of free radicals in the pathogenesis of diabetes and more

importantly in the development of diabetic complications (Lipinski 2001). Free radicals are capable of damaging cellular molecules, DNA, proteins and lipids leading to altered cellular functions (Tilak *et al.*, 2001). Many recent studies reveal that antioxidants capable of neutralizing free radicals are effective in preventing as well as reducing the severity of diabetic complications (Manisha Modak 2007). In spite of the presence of number of synthetic oral antidiabetic drugs in the market, researchers are now diverted their attention to different herbs and medicinal plants in order to find out new active principle with less side effects and better antidiabetic activity (Beigh *et al.*, 2002). Medicinal plants are being looked up once again for the treatment of diabetes. Many conventional drugs have been derived from prototypic molecules in medicinal plants (Ravindran 2011). Metformin exemplifies an efficacious oral glucose-lowering agent. Therefore *Emblica officinalis* was selected for the present study in order to provide some help in patronizing indigenous drugs. Its development was based on the use of *Emblica officinalis* to treat diabetes (Manisha Modak 2007). *Emblica officinalis* (EO) enjoys a hallowed position in Ayurveda - an Indian indigenous system of medicine (Khan 2009). EO primarily contains tannins, alkaloids, phenolic compounds, amino acids and carbohydrates. It is rich in chromium, which makes it very beneficial for diabetes. It has a therapeutic value in diabetes (Kumar Sampath 2012). It is also known to stimulate the isolated group of cells that secrete the hormone insulin. This decreases the blood sugar. Amla contains many nutrients, it is abundant with vitamin C and is beneficial for our body no matter in

what form it is eaten. It contains many minerals and vitamins like calcium, Phosphorous, iron, carotene and vitamin B complex (Gopalan *et al.*, 1997). It is also a powerful antioxidant, immunomodulator, hypoglycemic, hypolipidemic, hypotensive, antacid. Amla fruit is acrid, cool refrigerant diuretic, laxative, antipyretic vitamin C. 100gms of amla contains about 700mg of vitamin C, which is 30 times the amount found in orange. In addition to vitamin C it too contains calcium, iron, protein, sugar, phosphorous, carbohydrates gallic and tannic acids etc (Muthusamy 2008). In view of the present study was planned to see the effect of amla an approach towards the control of diabetes mellitus. Gooseberry contains chromium. It has a therapeutic value in diabetics. Indian Gooseberry or Amla stimulate the isolated group of cells that secrete the hormone insulin. Thus it reduces blood sugar in diabetic patient (Bhattacharya *et al.*, 1999).

## **Materials and Methods**

For this study we selected 60 T2DM subjects from Acharya Nagarjuna University in Guntur at Andhra Pradesh and they were divided into two groups, control group (N=30) and experimental group (N=30). They are all under the supervision of Physician till the end of the study. The data were collected on general information, background information, clinical information, anthropometry and 24 hour dietary recall along with fasting blood sugar, lipid profile and glycosylated hemoglobin. The experimental group of 30 patients was given a medium sized fresh Amla (approximately 35 g) on a

daily basis for 6 months. The Amla was procured from the local vegetable market of Guntur city. They were asked to consume the fruit in raw state daily before breakfast. During the course of supplementation no modification in the diet or medication was made for both experimental and control groups. The anthropometric measurements and Biochemical parameters like FBS, PPBS, HBA1C and lipid profile were monitored at the end of supplementation period. Supplementation of one medium size Amla(35g)for 6 months led to a significant decrease in the FBS,PPBS,HBA1C,Lipid profile values in the experimental group. There were no significant changes in the control group.

## **Result and Discussion**

Table.1 shows that there is significant decrease in FBS, PPBS and HbA1c of test group. Similar significant change in triglycerides and LDL of test group was seen and there was significant increase in HDL of test group. There was no significant change in all the parameters of the control group.

Table 2 indicates a significant decrease in the weight, BMI and waist- hip ratio in test group. Such a significant change in the control group was not found.

Diabetes mellitus has been defined by American Diabetes Association Expert Committee in their 1997 recommendations as a group of metabolic diseases characterized by hyperglycemia, altered metabolism of lipids, carbohydrates & proteins resulting from defects in insulin secretion, insulin action or both (Gillett 2009).The chronic hyperglycemia is associated with long damage, dysfunction

& failure of various organs especially eyes, kidneys, nerves, heart & blood vessels thus covering a wide range of heterogeneous disease (Tirgar *et al.*, 2010) The fruits of *Emblica officinalis* Gaertn. commonly known as amla or Indian gooseberry is known for its medicinal and therapeutic properties from ancient time in India and considered as a wonder fruit for health conscious population (Shah *et al.*, 2010). It is extensively found throughout India and some other Asian countries. The fruits are widely consumed raw, cooked, or pickled. The fruits of plant form a major constituent of many potent Ayurveda preparations and these preparations are widely used for their preventive, curative, and health restorative properties (Grover *et al.*, 2002). Amla contains highest amount of Vitamin C (ascorbic acid), low and high molecular weight tannins 30%, phyllembin (2.4%), phyllemblic acid (6.3%), gallic acid (1.32%), ellagic acid in natural form and cytokine like substances identified as Zeatin, Z riboside, Z nucleotide (Ghosal *et al.*, 1996) Amla fruit ash contains chromium, 2.5; zinc, 4; and copper, 3 ppm. Presence of chromium is of therapeutic value in diabetes. The fruit contains 482.14 units of superoxide dismutase/g fresh weight, and exhibited anti senescent activity (Ghosal *et al.*, 1996). In traditional medicine, the medicinal plants play a major role and constitute backbone of traditional medicine (Mukherjee *et al.*,2001) Synthetic hypoglycemic agents can produce serious side effects including hematological effects, coma and disturbances of liver and kidney. In addition, they are not suitable for use during pregnancy (Xia and Wang 2006). Compared to synthetic drugs, herbal preparations are frequently considered to be less toxic with fewer side effects (Odetola *et al.*, 2009). Therefore search

**Table.1** Metabolic parameters in type-2 diabetic patients of experimental and control group

S.No	Parameter	Experimental Group		Control group	
		Initial	Final	Initial	Final
1	FBS	174.73 ± 30.71	141.3 ± 26.03	177.5 ± 27.64	166.3 ± 30.40
2	PPBS	291.5 ± 41.11	239.5 ± 34.69	291.5 ± 37.7	265.93 ± 39.56
3	HBA1C	8.39 ± 0.64	7.51 ± 0.54	8.41 ± 0.57	8.06 ± 0.65
4	Triglycerides	165.26 ± 40.22	133 ± 27.33	164.7 ± 42.55	143.7 ± 40.22
5	HDL	34.66 ± 3.26	40.63 ± 3.27	34.03 ± 4.62	37.4 ± 4.46
6	LDL	124.66 ± 41.07	81.8 ± 31.16	131.13 ± 39.93	112.16 ± 39.3
7	VLDL	32.76 ± 7.86	26.5 ± 5.31	32.76 ± 8.38	28.43 ± 7.89
8	T.Cholesterol	195.33 ± 41.35	146.43 ± 31.06	198.03 ± 40.39	178 ± 39.57
9	S.Creatinine	1.04 ± 0.27	1.02 ± 0.18	1.10 ± 0.23	0.96 ± 0.22
10	Urea	38.93 ± 4.81	34.53 ± 4.86	38.6 ± 5.21	36.1 ± 5.31

**Table.2** Anthropometric measurements in type-2 diabetic patients of experimental and control group

S.No	Parameter	Experimental Group		Control group	
		Initial	Final	Initial	Final
1	Weight	73.23 ± 10.59	70.96 ± 10.30	62.33 ± 8.63	61.63 ± 8.51
2	Waist	94.6 ± 8.01	92.33 ± 8.03	88.5 ± 5.50	87.23 ± 5.18
3	Hip	101.56 ± 8.98	99.63 ± 8.67	98.8 ± 6.23	97.53 ± 6.08
4	W/H Ratio	0.928 ± 0.03	0.924 ± 0.03	0.89 ± 0.02	0.89 ± 0.27
5	BMI	25.75 ± 2.95	24.7 ± 2.89	24.83 ± 2.05	24.06 ± 2.14

for more effective and safer anti hyperglycemic has become an area of current research. The serum levels of total cholesterol, LDL, VLDL, HDL, triglycerides were determined at the start, at 6 months of treatment. There was a significant reduction in total cholesterol, LDL, VLDL and triglycerides whereas there was a significant elevation in the HDL level (Table 1 and 2).

It was very interesting that almost same antidiabetic effect was observed by chlorpropamide which is known to produce its effect by stimulating the release of endogenous insulin (Shamim *et al.*, 2009). This finding supports the earlier reports of phyllanthus species which were found to involve in regeneration and rejuvenation of  $\beta$  cells leading to an increased insulin production and secretion (Daisy *et al.*, 2004) This decreases the blood sugar.

From the results, it is clear that Amla supplemented group showed a favorable impact on the lipid profile of the subjects in this study. This could be due to the nutrient and photochemical composition of Amla. The fruit Amla is the richest source of vitamin C, containing more than 20 times that of orange. The gallotannins in the fruit preserve the vitamins under all conditions. The constituents of the fruit are carbohydrates (94%) proteins (0.5%) and a good amount of pectin. It is believed that what gold is to minerals, Amla is to the herbs. The edible fruit tissue contains protein concentration, ascorbic acid, minerals and amino acids. Fruit also contains phyllembelin and curcuminoids.

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